

# PATENT ABSTRACTS OF JAPAN

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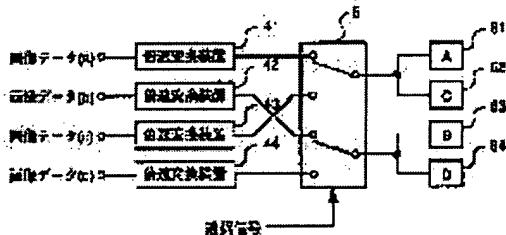
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## (54) DRIVING DEVICE FOR PROJECTION TYPE DISPLAY DEVICE

### (57)Abstract:

**PURPOSE:** To transmit high definition picture data without flicker in compliance with an existing transmission standard by scanning two double speed conversion interlace picture signals whose scanning line differs for each half period of a horizontal synchronizing signal and distributing the result to two projection type display units.

**CONSTITUTION:** High definition picture data are decomposed into four picture data (a)-(d) and each of them is transmitted as an interlace signal through transmission systems A-D. The high definition picture data of a scanning line and those at two preceding scanning line in an odd frame are transmitted as interlace signals by deviating a half of the period of the horizontal synchronizing signal. The display device uses double speed converters 41-44 to convert the speed of the signal to be twice and a data distributor 5 distributes the resulting signal to the upper unit for the first half of one horizontal period and to the lower unit for the latter half period. The signals not transmitted in the odd number field are sent and displayed in an even number field similarly.



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**CLAIMS**

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**[Claim(s)]**

[Claim 1]A drive of a projection type display which inputs two or more interlace image signals, displays with  $2 \times n$  projected type display units ( $n \geq 1$ ), and superimposed each picture between pixels on a screen characterized by comprising the following.

A means which carries out double-speed conversion of said interlace image signal.

A means to scan said two picture signals from which a scanning line differs and which carried out double-speed conversion for every half cycle of a Horizontal Synchronizing signal, and to distribute to two sets of projected type display units.

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**DETAILED DESCRIPTION**

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**[Detailed Description of the Invention]****[0001]**

[Industrial Application]This invention relates to the drive of what is called a projection type display which combines the picture of two or more projected type display units on a screen, and displays a high definition picture.

**[0002]**

[Description of the Prior Art]The method using CRT (Cathode Ray Tube) and a liquid crystal panel as a projection type display of a big screen is known well. Especially, the method using a liquid crystal panel is advantageous in a miniaturization, conservativeness, etc., and development is furthered as high definition display devices, such as HDTV (High Definition TV).

[0003]In the conventional projection type display using a liquid crystal panel, when the pixel number tended to be increased and it was going to carry out highly minute-ization further, there was a problem in the production technology of a liquid crystal panel, drive circuit art, etc. For example, if a pixel number increases, the numerical aperture of per stroke matter will fall and the utilization efficiency of light will fall. In order to avoid this, it is necessary to enlarge area of the whole liquid crystal panel but, and. In the liquid crystal panel using TFT (Thin Film Transistor). It becomes very difficult [ it / to be defect-free and to manufacture the thing of a large area ], and if a pixel number increases, a source line must be driven at high speed, but the working speed of the driver IC which drives a source line is quite [ military requirement ] a low speed. Therefore, if it is going to carry out a still more nearly high-speed drive, composition which makes a driver IC a polyphase and operates it must be taken. However, manufacture of the substrate which connects a liquid crystal panel with a driver IC in such composition is difficult.

[0004]For such a problem, a liquid crystal projection unit independent does not realize highly minute-ization, but the projection type display displayed so that it may be superimposed on between pixels on a screen is proposed using two or more liquid crystal projection units (Japanese Patent Application No. 3-30111).

[0005]The example of such a display is shown in drawing 5. However, since it is easy here, the case where the picture of four liquid crystal projection units is superimposed is explained. As for high definition image data and 2, in drawing 5, a transmission system, and 61-64 are liquid crystal projection units an image data cracking unit, and 31-34 1. 91-94 are the examples of a superimposing optical system, and are half mirrors here. 8 is a screen.

[0006]It decomposes into four image data (a) which thinned out the horizontal pixel and the scanning line like drawing 6, and made this the pixel number of every direction 1/2, (b), (c), and (d) noting that there is the high definition image data 1 now. This decomposed image data (a), (b), (c), and (d) are supplied to the liquid crystal projection units 61-64, respectively, and between pixels is superimposed and displayed on the screen 8 according to the superimposing optical systems 91-94.

[0007]In the case of an active matrix type liquid crystal panel, a light shielding part as shown in the

left figure of drawing 7 by hatching portions exists in each pixel at a pixel for a wiring area. A length and twice as many width [ as this ] high definition display is attained using this by superimposing between pixels, as shown in [ in the right figure of drawing 7 ]. Other methods are proposed although the method of using a half mirror as shown in drawing 5 as the superimposing optical systems 91-94 is the easiest.

[0008]

[Problem(s) to be Solved by the Invention]In such a superposition projection method, when the image data (a) decomposed into four, (b), (c), and (d) are images, in order considering the transmission system of picture image data to reduce the transmission capacity, usually it transmits with an interlace system. There are NTSC system and a HDTV system as a typical method. When considering the storage system of picture image data, such as VTR, it is similarly accumulated with an interlace system.

[0009]Therefore, also when displaying an image with high definition with a superposition projection method, it is important to have an existing interlace system and interface. In order to display the image data (a) which is the existing interlace signal, (b), (c), and (d) on a liquid crystal projection unit, the following drive systems can be considered. However, since resolution horizontal in any case does not change, only a vertical scanning mode is explained. As shown in drawing 8, the image data of each scanning line will be expressed with the sign which gave the a number of number to O, \*\*, \*\*, and x so that explanation may become easy.

[0010]The method shown in drawing 9 in an odd number field (a). O And scan two scanning lines of \*\* simultaneously and the video signal of the scanning line of O and \*\* which scan \*\* and x simultaneously distributes the video signal of \*\* and x to the liquid crystal projection units AA and BB in an even number field (b) at the liquid crystal projection units CC and DD. In drawing 9, it is shown that the scanning line of a dashed line is non-display. With this scanning mode, while an interface with the existing interlace system can be taken, horizontal scan frequency of a liquid crystal projection unit can be made the same as the number of horizontal scannings of an input signal.

[0011]However, since it becomes the writing of every other field about each pixel, if an exchange-ized cycle peculiar to a liquid crystal panel is taken into consideration, the flicker of one fourth of the frequency of field frequency will arise. Usually, since the field frequency of a picture is about 60 Hz, flicker frequency has the problem that it is set to about 15 Hz and a flicker is conspicuous. For this reason, display quality is bad and it is not practical. In the non-writing in field, in order that the electric charge written in the pixel might escape and go, there was a problem that contrast fell.

[0012]Made in order that this invention may solve said problem, the purpose of this invention is to provide the projection type display which displays a high definition picture without a flicker using the video signal of the existing interlace system.

[0013]The other purposes and the new features are clarified with description and the accompanying drawing of this specification at said row of this invention.

[0014]

[Means for Solving the Problem]In order that this invention may solve said problem, this invention, In a drive of a projection type display which inputs two or more interlace image signals, displays with  $2 \times n$  projected type display units ( $n \geq 1$ ), and superimposed each picture between pixels on a screen, It is characterized [ main ] by forming a means which carries out double-speed conversion of said interlace image signal, and a means to scan said two picture signals from which a scanning line differs and which carried out double-speed conversion for every half cycle of a Horizontal Synchronizing signal, and to distribute to two sets of projected type display units.

[0015]

[Function]According to the above-mentioned means, first, in an odd frame, one half of the cycles of a horizontal synchronizing signal period are shifted, and the image data under some one scanning line and its 2 scanning lines is transmitted with an interlace signal from high definition image data. In

the display side, double-speed conversion of this signal is carried out, and a means which is distributed to an upper unit in the first half of a certain one horizontal period, and is distributed to a lower unit in the period of the second half is formed. In an even number field, the signal which was not transmitted in an odd number field is transmitted and displayed similarly.

[0016]By constituting in this way, high definition image data can be transmitted by the existing transmission standard. For example, four the transmission systems and storage systems of a HDTV standard can be used for transmission of image data with one 4 times the definition of HDTV, and accumulation as they are.

[0017]The refreshment frequency of a liquid crystal projection unit is 1/2 of the field frequency of a transmission standard. Therefore, it does not become lower than the flicker frequency of the existing liquid crystal panel. In a Prior art, unless it was made to make flicker frequency low, the fall of vertical resolution was not avoided, but according to this invention, a high definition display can be performed, without reducing flicker frequency. As a result, a big screen and a high definition display system unrealizable in the existing liquid crystal display can be provided cheaply.

[0018]

[Example]Hereafter, with reference to drawings, the example of this invention is described in detail.

[0019]Drawing 1 is a block diagram showing the outline composition of one example of the drive of the projection type display of this invention.

As for 41-44, data distribution apparatus, and 61-64 are liquid crystal projection units a double-speed inverter and 5.

[0020]The drive of the projection type display of this example like the Prior art mentioned above, The high definition image data which picturized with the camera or the scanner or was created by the computer graphic, It decomposes into four image data (a) as shown in drawing 6 with a data cracking unit, (b), (c), and (d), and each image data is transmitted as an interlace signal by the transmission system A, B, and C and D, respectively. Since it is only vertical resolution, as the paragraph of explanation of a Prior art showed, it carries out considering it as a problem by this invention to representing the original high definition image data with data like drawing 8.

[0021]As shown in drawing 2, odd number fields are O and \*\* and an even number field shows the data of the scanning line transmitted to a certain horizontal period to the wave-like bottom by \*\* and x.

[0022]In the display side, with the double-speed inverters 41-44, the transmitted signal is changed into the signal of double speed, as shown in drawing 3. This reproduces the image data of 1H period twice in 1H period.

It is actually used with the device which changes an interlace signal into a non-interlace signal. As an easy device, a video signal is changed into digital data, the line memory which accumulates the digital video signal for one scanning line is provided two pieces in parallel, and it can realize by repeating the writing of these two line memories, and read-out by turns.

[0023]By supplying the selection signal which shows drawing 3 this image data that carried out double-speed conversion to the data distribution apparatus 5, as shown in drawing 4, it distributes to each liquid crystal projection unit. First, in period  $T_1$  of the beginning of an odd number field, image data is distributed and displayed on the 1st scanning line (A-1, B-1, C-1, D-1) of each liquid crystal projection unit. In the next period  $T_2$ , image data is distributed and displayed on the 2nd scanning line (A-2, B-2, C-2, D-2) of each liquid crystal projection unit. It repeats in a similar manner after that.

[0024]Next, in period  $T_1$  of the beginning of an even number field, image data is distributed and displayed on the 1st scanning line (C-1, D-1) in the liquid crystal projection unit of A and B system in the liquid crystal projection unit of the 2nd scanning line (A-2, B-2), C, and D system. In the next period  $T_2$ , image data is distributed and displayed on the 2nd scanning line (C-2, D-2) in the liquid

crystal projection unit of A and B system in the liquid crystal projection unit of the 3rd scanning line (A-3, B-3), C, and D system. It repeats in a similar manner after that. Thus, in an odd number field and an even number field, the structure of the original high definition images is reproduced by shifting the combination of a scanning line by one scanning line in A, B system, and C and D system.

[0025]The picture projected with each liquid crystal projection unit is eventually displayed on a screen by superimposing optical system which was explained by the paragraph of the Prior art.

[0026]According to this example, high definition image data can be transmitted by the existing transmission standard so that the above explanation may show. For example, four the transmission systems and storage systems of a HDTV standard can be used for transmission of image data with one 4 times the definition of HDTV, and accumulation as they are.

[0027]The refreshment frequency of a liquid crystal projection unit is 1/2 of the field frequency of a transmission standard. Therefore, it does not become lower than the flicker frequency of the existing liquid crystal panel. In a Prior art, unless it was made to make flicker frequency low, the fall of vertical resolution was not avoided, but according to this example, a high definition display can be performed, without reducing flicker frequency. As a result, in the existing liquid crystal display, an unrealizable big screen and high definition display system can be provided cheaply.

[0028]As mentioned above, although this invention was concretely explained based on the example, it cannot be overemphasized that it can change variously in the range which this invention is not limited to said example and does not deviate from the gist.

[0029]

[Effect of the Invention]As explained above, according to this invention, high definition image data can be transmitted by the existing transmission standard. A high definition display can be performed without reducing flicker frequency. As a result, a big screen and a high definition display system unrealizable in the existing liquid crystal display can be provided cheaply.

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**TECHNICAL FIELD**

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**PRIOR ART**

[Description of the Prior Art]The method using CRT (Cathode Ray Tube) and a liquid crystal panel as a projection type display of a big screen is known well. Especially, the method using a liquid crystal panel is advantageous in a miniaturization, conservativeness, etc., and development is furthered as high definition display devices, such as HDTV (High Definition TV).

[0003]In the conventional projection type display using a liquid crystal panel, when the pixel number tended to be increased and it was going to carry out highly minute-ization further, there was a problem in the production technology of a liquid crystal panel, drive circuit art, etc. For example, if a pixel number increases, the numerical aperture of per stroke matter will fall and the utilization efficiency of light will fall. In order to avoid this, it is necessary to enlarge area of the whole liquid crystal panel but, and. In the liquid crystal panel using TFT (Thin Film Transistor). It becomes very difficult [ it / to be defect-free and to manufacture the thing of a large area ], and if a pixel number increases, a source line must be driven at high speed, but the working speed of the driver IC which drives a source line is quite [ military requirement ] a low speed. Therefore, if it is going to carry out a still more nearly high-speed drive, composition which makes a driver IC a polyphase and operates it must be taken. However, manufacture of the substrate which connects a liquid crystal panel with a driver IC in such composition is difficult.

[0004]For such a problem, a liquid crystal projection unit independent does not realize highly minute-ization, but the projection type display displayed so that it may be superimposed on between pixels on a screen is proposed using two or more liquid crystal projection units (Japanese Patent Application No. 3-30111).

[0005]The example of such a display is shown in drawing 5. However, since it is easy here, the case where the picture of four liquid crystal projection units is superimposed is explained. As for high definition image data and 2, in drawing 5, a transmission system, and 61-64 are liquid crystal projection units an image data cracking unit, and 31-34 1. 91-94 are the examples of a superimposing optical system, and are half mirrors here. 8 is a screen.

[0006]It decomposes into four image data (a) which thinned out the horizontal pixel and the scanning line like drawing 6, and made this the pixel number of every direction 1/2, (b), (c), and (d) noting that there is the high definition image data 1 now. This decomposed image data (a), (b), (c), and (d) are supplied to the liquid crystal projection units 61-64, respectively, and between pixels is superimposed and displayed on the screen 8 according to the superimposing optical systems 91-94.

[0007]In the case of an active matrix type liquid crystal panel, a light shielding part as shown in the left figure of drawing 7 by hatching portions exists in each pixel at a pixel for a wiring area. A length and twice as many width [ as this ] high definition display is attained using this by superimposing between pixels, as shown in [ in the right figure of drawing 7 ]. Other methods are proposed although the method of using a half mirror as shown in drawing 5 as the superimposing optical systems 91-94 is the easiest.

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**EFFECT OF THE INVENTION**

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[Effect of the Invention]As explained above, according to this invention, high definition image data can be transmitted by the existing transmission standard. A high definition display can be performed without reducing flicker frequency. As a result, a big screen and a high definition display system unrealizable in the existing liquid crystal display can be provided cheaply.

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**TECHNICAL PROBLEM**

[Problem(s) to be Solved by the Invention]In such a superposition projection method, when the image data (a) decomposed into four, (b), (c), and (d) are images, in order considering the transmission system of picture image data to reduce the transmission capacity, usually it transmits with an interlace system. There are NTSC system and a HDTV system as a typical method. When considering the storage system of picture image data, such as VTR, it is similarly accumulated with an interlace system.

[0009]Therefore, also when displaying an image with high definition with a superposition projection method, it is important to have an existing interlace system and interface. In order to display the image data (a) which is the existing interlace signal, (b), (c), and (d) on a liquid crystal projection unit, the following drive systems can be considered. However, since resolution horizontal in any case does not change, only a vertical scanning mode is explained. As shown in drawing 8, the image data of each scanning line will be expressed with the sign which gave the a number of number to O, \*\*, \*\*, and x so that explanation may become easy.

[0010]The method shown in drawing 9 in an odd number field (a). O And scan two scanning lines of \*\* simultaneously and the video signal of the scanning line of O and \*\* which scan \*\* and x simultaneously distributes the video signal of \*\* and x to the liquid crystal projection units AA and BB in an even number field (b) at the liquid crystal projection units CC and DD. In drawing 9, it is shown that the scanning line of a dashed line is non-display. With this scanning mode, while an interface with the existing interlace system can be taken, horizontal scan frequency of a liquid crystal projection unit can be made the same as the number of horizontal scannings of an input signal.

[0011]However, since it becomes the writing of every other field about each pixel, if an exchange-ized cycle peculiar to a liquid crystal panel is taken into consideration, the flicker of one fourth of the frequency of field frequency will arise. Usually, since the field frequency of a picture is about 60 Hz, flicker frequency has the problem that it is set to about 15 Hz and a flicker is conspicuous. For this reason, display quality is bad and it is not practical.. In the non-writing in field, in order that the electric charge written in the pixel might escape and go, there was a problem that contrast fell.

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**MEANS**

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[Means for Solving the Problem]In order that this invention may solve said problem, this invention, In a drive of a projection type display which inputs two or more interlace image signals, displays with  $2 \times n$  projected type display units ( $n \geq 1$ ), and superimposed each picture between pixels on a screen, It is characterized [ main ] by forming a means which carries out double-speed conversion of said interlace image signal, and a means to scan said two picture signals from which a scanning line differs and which carried out double-speed conversion for every half cycle of a Horizontal Synchronizing signal, and to distribute to two sets of projected type display units.

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**OPERATION**

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[Function]According to the above-mentioned means, first, in an odd frame, one half of the cycles of a horizontal synchronizing signal period are shifted, and the image data under some one scanning line and its 2 scanning lines is transmitted with an interlace signal from high definition image data. In the display side, double-speed conversion of this signal is carried out, and a means which is distributed to an upper unit in the first half of a certain one horizontal period, and is distributed to a lower unit in the period of the second half is formed. In an even number field, the signal which was not transmitted in an odd number field is transmitted and displayed similarly.

[0016]By constituting in this way, high definition image data can be transmitted by the existing transmission standard. For example, four the transmission systems and storage systems of a HDTV standard can be used for transmission of image data with one 4 times the definition of HDTV, and accumulation as they are.

[0017]The refreshment frequency of a liquid crystal projection unit is 1/2 of the field frequency of a transmission standard. Therefore, it does not become lower than the flicker frequency of the existing liquid crystal panel. In a Prior art, unless it was made to make flicker frequency low, the fall of vertical resolution was not avoided, but according to this invention, a high definition display can be performed, without reducing flicker frequency. As a result, a big screen and a high definition display system unrealizable in the existing liquid crystal display can be provided cheaply.

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**EXAMPLE**

[Example]Hereafter, with reference to drawings, the example of this invention is described in detail.  
[0019]Drawing 1 is a block diagram showing the outline composition of one example of the drive of the projection type display of this invention.

As for 41–44, data distribution apparatus, and 61–64 are liquid crystal projection units a double-speed inverter and 5.

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[0021]As shown in drawing 2, odd number fields are O and \*\* and an even number field shows the data of the scanning line transmitted to a certain horizontal period to the wave-like bottom by \*\* and x.

[0022]In the display side, with the double-speed inverters 41–44, the transmitted signal is changed into the signal of double speed, as shown in drawing 3. This reproduces the image data of 1H period twice in 1H period.

It is actually used with the device which changes an interlace signal into a non-interlace signal. As an easy device, a video signal is changed into digital data, the line memory which accumulates the digital video signal for one scanning line is provided two pieces in parallel, and it can realize by repeating the writing of these two line memories, and read-out by turns.

[0023]By supplying the selection signal which shows drawing 3 this image data that carried out double-speed conversion to the data distribution apparatus 5, as shown in drawing 4, it distributes to each liquid crystal projection unit. First, in period  $T_1$  of the beginning of an odd number field, image data is distributed and displayed on the 1st scanning line (A-1, B-1, C-1, D-1) of each liquid crystal projection unit. In the next period  $T_2$ , image data is distributed and displayed on the 2nd scanning line (A-2, B-2, C-2, D-2) of each liquid crystal projection unit. It repeats in a similar manner after that.

[0024]Next, in period  $T_1$  of the beginning of an even number field, image data is distributed and displayed on the 1st scanning line (C-1, D-1) in the liquid crystal projection unit of A and B system in the liquid crystal projection unit of the 2nd scanning line (A-2, B-2), C, and D system. In the next period  $T_2$ , image data is distributed and displayed on the 2nd scanning line (C-2, D-2) in the liquid crystal projection unit of A and B system in the liquid crystal projection unit of the 3rd scanning line (A-3, B-3), C, and D system. It repeats in a similar manner after that. Thus, in an odd number field

and an even number field, the structure of the original high definition images is reproduced by shifting the combination of a scanning line by one scanning line in A, B system, and C and D system.

[0025]The picture projected with each liquid crystal projection unit is eventually displayed on a screen by superimposing optical system which was explained by the paragraph of the Prior art.

[0026]According to this example, high definition image data can be transmitted by the existing transmission standard so that the above explanation may show. For example, four the transmission systems and storage systems of a HDTV standard can be used for transmission of image data with one 4 times the definition of HDTV, and accumulation as they are.

[0027]The refreshment frequency of a liquid crystal projection unit is 1/2 of the field frequency of a transmission standard. Therefore, it does not become lower than the flicker frequency of the existing liquid crystal panel. In a Prior art, unless it was made to make flicker frequency low, the fall of vertical resolution was not avoided, but according to this example, a high definition display can be performed, without reducing flicker frequency. As a result, in the existing liquid crystal display, an unrealizable big screen and high definition display system can be provided cheaply.

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**DESCRIPTION OF DRAWINGS**

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**[Brief Description of the Drawings]**

[Drawing 1]The block diagram showing the outline composition of one example of the drive of the projection type display of this invention,

[Drawing 2]The figure showing 2-H-period[ 1 / ]-shifting the image data into which this example was decomposed, and transmitting it,

[Drawing 3]The figure showing the picture signal with which double-speed conversion of this example was carried out,

[Drawing 4]The figure showing the image data displayed in an odd number field and an even number field in this example,

[Drawing 5]The figure showing the example of the conventional display,

[Drawing 6]The figure for explaining how high definition image data is decomposed,

[Drawing 7]The figure for explaining that the original high definition images can be displayed by superimposing between pixels,

[Drawing 8]The figure for explaining correspondence with the original high definition image data and the figure for explanation,

[Drawing 9]The figure showing the image data displayed in an odd number field and an even number field in the conventional display.

**[Description of Notations]**

1 [ -- A double-speed inverter 5 / -- Data distribution apparatus, 61-64 / -- A liquid crystal projection unit, 7 / -- A superimposing optical system, 8 / -- A screen, 91-94 / -- Half mirror. ] -- High definition image data, 2 -- An image data cracking unit, 31-34 -- A transmission system, 41-44

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[Translation done.]

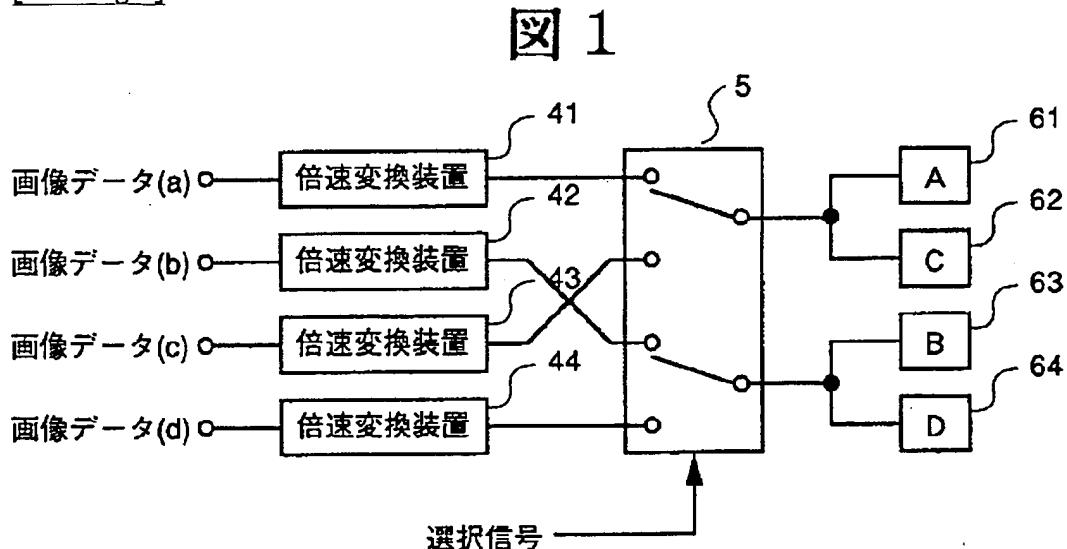
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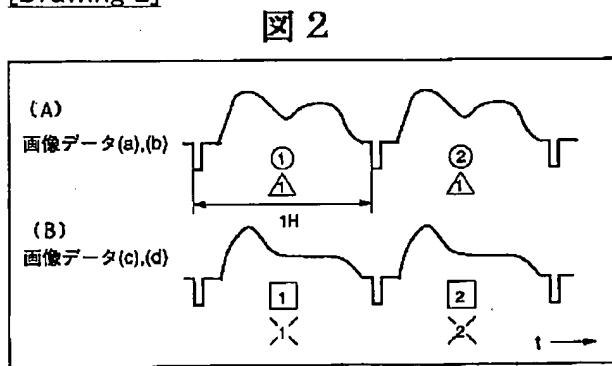
1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
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## DRAWINGS

[Drawing 1]

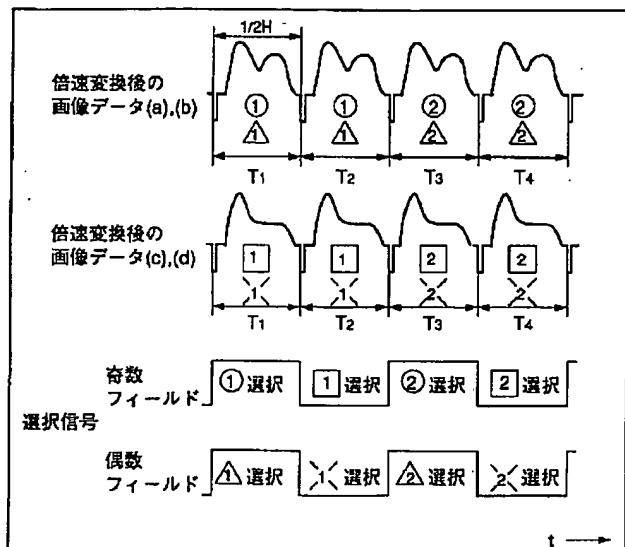


[Drawing 2]



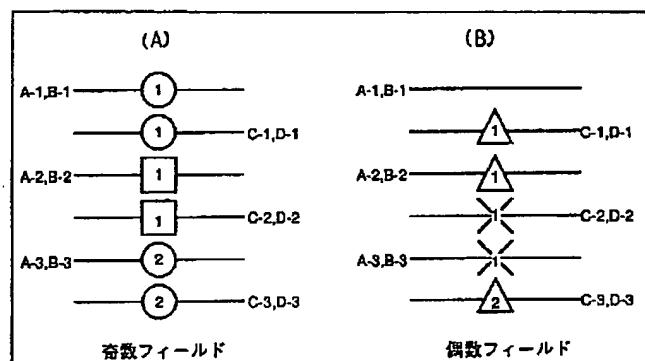
[Drawing 3]

図 3



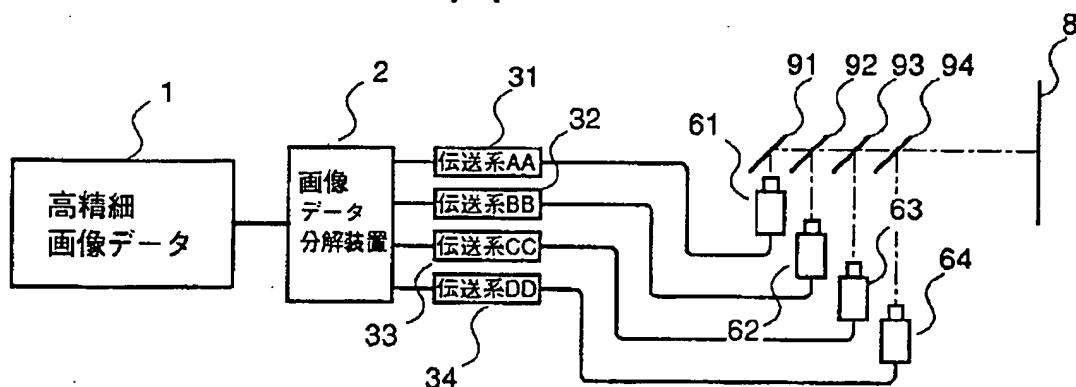
[Drawing 4]

図 4



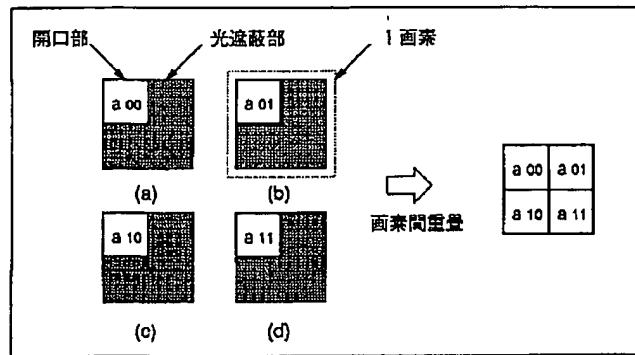
[Drawing 5]

図 5



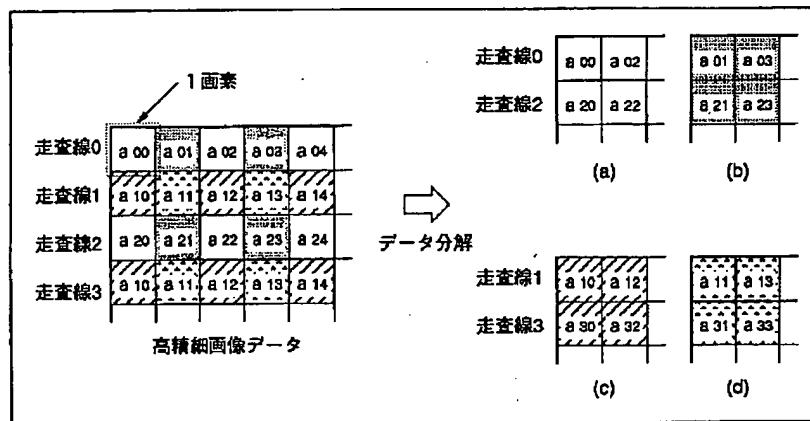
[Drawing 7]

図 7



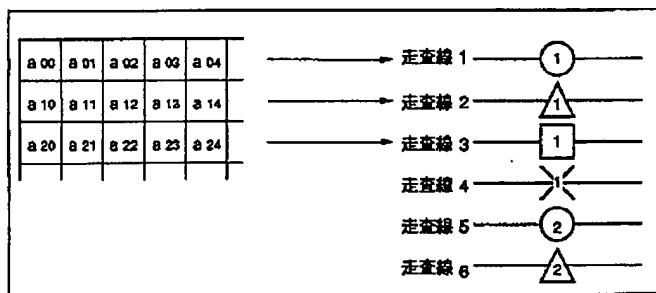
[Drawing 6]

図 6



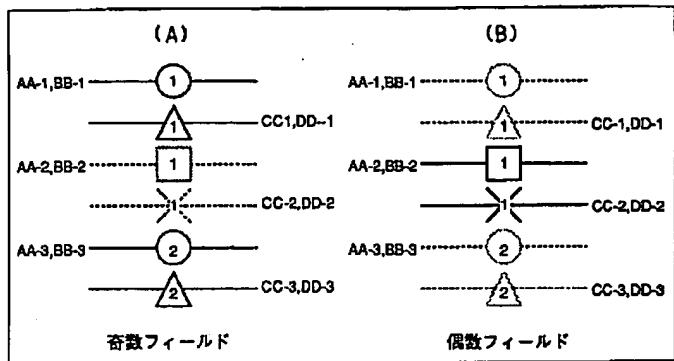
[Drawing 8]

図 8



[Drawing 9]

図 9



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[Translation done.]

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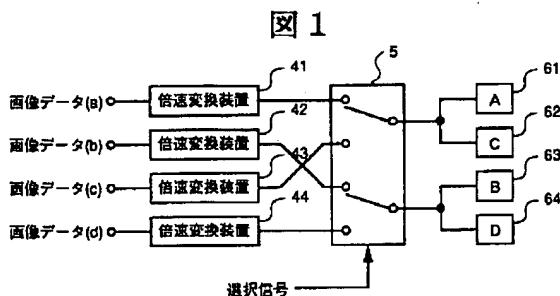
(74)代理人 弁理士 秋田 収喜

(54)【発明の名称】 投写型表示装置の駆動装置

(57)【要約】

【目的】 既存のインターレース方式の映像信号を用いて、フリッカの無い高精細な画像を表示する投写型表示装置を提供する。

【構成】 複数のインターレース画像信号を入力して  $2 \times n$  個 ( $n \geq 1$ ) の投写型表示ユニットで表示し、スクリーン上で各画像を画素間に重畳するようにした投写型表示装置の駆動装置において、前記インターレース画像信号を倍速変換する手段と、走査線の異なる2つの前記倍速変換した画像信号を水平同期信号の半周期毎に走査し、2台の投写型表示ユニットに分配する手段とを設ける。



## 【特許請求の範囲】

【請求項1】複数のインターレース画像信号を入力して $2 \times n$ 個( $n \geq 1$ )の投写型表示ユニットで表示し、スクリーン上で各画像を画素間に重畳するようにした投写型表示装置の駆動装置において、前記インターレース画像信号を倍速変換する手段と、走査線の異なる2つの前記倍速変換した画像信号を水平同期信号の半周期毎に走査し、2台の投写型表示ユニットに分配する手段とを設げたことを特徴とする投写型表示装置の駆動装置。

## 【発明の詳細な説明】

## 【0001】

【産業上の利用分野】本発明は、複数の投写型表示ユニットの画像をスクリーン上で合成して高精細な画像を表示する、いわゆる投写型表示装置の駆動装置に関するものである。

## 【0002】

【従来の技術】大画面の投写型表示装置として、CRT(Cathode Ray Tube)や液晶パネルを用いた方式が良く知られている。中でも、液晶パネルを用いた方式は、小型化や保守性等において有利であり、HDTV(High Definition TV)等の高精細表示装置として開発が進められている。

【0003】液晶パネルを用いた従来の投写型表示装置において、さらに、画素数を多くして高精細化をしようとすると、液晶パネルの製造技術、駆動回路技術等において問題があった。例えば、画素数が多くなると、一画素当りの開口率が低下し、光の利用効率が低下する。これを避けるためには、液晶パネル全体の面積を大きくする必要があるが、TFT(Thin Film Transistor)を用いた液晶パネルでは、大面积のものを無欠陥で製作することは非常に困難となる、また、画素数が多くなると、ソース線を高速に駆動しなくてはならないが、ソース線を駆動するドライバICの動作速度は、要求性能よりもかなり低速である。従って、さらに高速な駆動をしようとすれば、ドライバICを多相にして動作させるような構成をとらざるを得ない。しかし、このような構成では、ドライバICと液晶パネルを接続する基板の製作が困難である。

【0004】このような問題のため、液晶投写ユニット単独で高精細化を実現するのではなく、複数の液晶投写ユニットを利用して、スクリーン上で画素間が重畳されるように表示する投写型表示装置が提案されている(特願平3-30111)。

【0005】図5にこのような表示装置の例を示す。ただし、ここでは簡単のために、4つの液晶投写ユニットの画像を重畳する場合について説明する。図5において、1は高精細画像データ、2は画像データ分解装置、31~34は伝送系、61~64は液晶投写ユニットである。91~94は重畳光学系の例であり、ここではハーフミラーである。8はスクリーンである。

【0006】いま、高精細な画像データ1があるとして、これを図6のように水平方向画素と走査線を間引いて縦横1/2の画素数にした4つの画像データ(a),(b),(c),(d)に分解する。この分解した画像データ(a),(b),(c),(d)をそれぞれ液晶投写ユニット61~64に供給し、重畳光学系91~94によって、スクリーン8上で画素間を重畳して表示する。

【0007】アクティブラトリクス型液晶パネルの場合、画素には配線領域のため、図7の左図にハッチング部で示すような光遮蔽部が各画素に存在する。このことを利用して、図7の右図のように画素間を重畳することにより、縦、横2倍の高精細な表示が可能となる。重畳光学系91~94としては、図5に示すようなハーフミラーを用いる方法が最も簡単であるが、他の方式も提案されている。

## 【0008】

【発明が解決しようとする課題】このような重畳投写方式において、4つに分解された画像データ(a),(b),(c),(d)が映像である場合、映像データの伝送系を考えると、その伝送容量を低減するために、インターレース方式で伝送するのが普通である。代表的な方式としてNTSC方式、HDTV方式がある。VTR等の映像データの蓄積系を考える場合も同様にしてインターレース方式で蓄積される。

【0009】従って、重畳投写方式によって映像を高精細に表示する場合も既存のインターレース方式とインターフェースを持つことが重要である。既存のインターレース信号である画像データ(a),(b),(c),(d)を液晶投写ユニットに表示するには、次のような駆動方式が考えられる。ただし、いずれの場合も、水平方向の解像度は変わらないので、垂直方向の走査方式についてのみ説明する。説明が容易になるように、図8に示すように各走査線の画像データを○、△、□、×に何番目かの数字を付した記号で表すこととする。

【0010】図9に示す方式は、奇数フィールド(a)では、○及び△の2本の走査線を同時に走査し、偶数フィールド(b)では、□及び×を同時に走査する、○及び□の走査線の映像信号は、液晶投写ユニットAA及びBBに、△及び×の映像信号を液晶投写ユニットCC及びDDに分配する。図9中において、破線の走査線は非表示であることを示す。この走査方式により、既存のインターレース方式とのインターフェースがとれると同時に、液晶投写ユニットの水平走査周波数を入力信号の水平走査数と同じとすることができる。

【0011】しかしながら、各画素については1フィールドおきの書き込みとなるので、液晶パネル特有の交流化周期を考慮すると、フィールド周波数の1/4の周波数のフリッカが生じる。通常、画像のフィールド周波数は60Hz程度なので、フリッカ周波数は15Hz程度となってフリッカが目立つという問題がある。このた

め、表示品質が悪く、実用的でない。さらに、非書き込みフィールドにおいては、画素に書き込まれた電荷が逃げて行くために、コントラストが低下するという問題があった。

【0012】本発明は、前記問題点を解決するためになされたものであり、本発明の目的は、既存のインターレース方式の映像信号を用いて、フリッカの無い高精細な画像を表示する投写型表示装置を提供することにある。

【0013】本発明の前記ならびにその他の目的及び新規な特徴は、本明細書の記述及び添付図面によって明らかにする。

#### 【0014】

【課題を解決するための手段】本発明は、前記問題点を解決するために、本発明は、複数のインターレース画像信号を入力して  $2 \times n$  個 ( $n \geq 1$ ) の投写型表示ユニットで表示し、スクリーン上で各画像を画素間に重畳するようにした投写型表示装置の駆動装置において、前記インターレース画像信号を倍速変換する手段と、走査線の異なる2つの前記倍速変換した画像信号を水平同期信号の半周期毎に走査し、2台の投写型表示ユニットに分配する手段とを設けたことを最も主要な特徴とする。

#### 【0015】

【作用】前述の手段によれば、まず、高精細な画像データから、奇数フレームにおいては、ある1走査線とその2走査線下の画像データを水平同期信号周期の  $1/2$  の周期をずらしてインターレース信号で伝送する。表示装置側では、この信号を倍速変換し、ある1水平期間の前半では上側のユニットに、後半の期間では下側のユニットに分配するような手段を設ける。偶数フィールドにおいては、奇数フィールドで伝送しなかった信号を同様に伝送、表示する。

【0016】このように構成することにより、高精細な画像データを既存の伝送規格で伝送することができる。例えば、HDTVの4倍の精細度を持った画像データの伝送、蓄積には、HDTV規格の伝送系や蓄積系を4系統そのまま利用できる。

【0017】また、液晶投写ユニットのリフレッシュ周波数は、伝送規格のフィールド周波数の  $1/2$  である。従って、既存の液晶パネルのフリッカ周波数より低くすることはない。従来の技術では、フリッカ周波数を低くしないようにすると、垂直方向の解像度の低下が避けられなかつたが、本発明によれば、フリッカ周波数を低下させることなく高精細な表示を行うことができる。その結果、既存の液晶表示装置では実現不可能な大画面、高精細表示システムを安価に提供することができる。

#### 【0018】

【実施例】以下、図面を参照して、本発明の実施例を詳細に説明する。

【0019】図1は、本発明の投写型表示装置の駆動装置の一実施例の概略構成を示すブロック図であり、41

～44は倍速変換装置、5はデータ分配装置、61～64は液晶投写ユニットである。

【0020】本実施例の投写型表示装置の駆動装置は、前述した従来の技術のように、カメラやスキャナで撮像したり、コンピュータグラフィックによって作成された高精細な画像データを、データ分解装置によって図6に示すような4つの画像データ(a), (b), (c), (d)に分解し、各画像データをそれぞれ传送系A, B, C, Dでインターレース信号として传送する。本発明で問題とするのは、垂直方向の解像度のみであるので、従来の技術の説明の項で示したように、元の高精細な画像データを図8のようなデータで代表させることにする。

【0021】ある水平期間に伝送される走査線のデータを、図2に示すように、波形の下側に、奇数フィールドは○、△で、偶数フィールドは□、×で示す。

【0022】表示装置側では、伝送されてきた信号を倍速変換装置41～44で、図3に示すように倍速の信号に変換する。これは、1H期間の画像データを1H期間で2回再生するものであり、インターレース信号をノンインターレース信号に変換するような装置で実際に用いられている。簡単な装置としては、映像信号をデジタルデータに変換し、1走査線分のデジタル映像信号を蓄積するラインメモリを並列に2個設け、この2つのラインメモリの書き込み、読みだしを交互に繰り返すことにより実現できる。

【0023】この倍速変換した画像データを、図3に示す選択信号をデータ分配装置5に供給することによって、図4に示すように各液晶投写ユニットに分配する。まず、奇数フィールドの最初の期間T<sub>1</sub>においては、各液晶投写ユニットの1番目の走査線(A-1, B-1とC-1, D-1)に画像データを分配し表示する。次の期間T<sub>2</sub>においては、各液晶投写ユニットの2番目の走査線(A-2, B-2とC-2, D-2)に画像データを分配し表示する。その後は同様に繰り返す。

【0024】次に、偶数フィールドの最初の期間T<sub>1</sub>においては、A, B系統の液晶投写ユニットにおいては、2番目の走査線(A-2, B-2)、C, D系統の液晶投写ユニットにおいては、1番目の走査線(C-1, D-1)に画像データを分配し表示する。次の期間T<sub>2</sub>においては、A, B系統の液晶投写ユニットにおいては、3番目の走査線(A-3, B-3)、C, D系統の液晶投写ユニットにおいては、2番目の走査線(C-2, D-2)に画像データを分配し表示する。その後は同様に繰り返す。このように、奇数フィールドと偶数フィールドにおいて、A, B系統とC, D系統とで走査線の組み合わせを1走査線分ずらすことにより、元の高精細画像の構造を再現するようにする。

【0025】各液晶投写ユニットによって投写された画像は、従来の技術の項で説明したような重畠光学系によ

って、最終的にスクリーン上に表示される。

【0026】以上の説明からわかるように、本実施例によれば、高精細な画像データを既存の伝送規格で伝送することができる。例えば、HDTVの4倍の精細度を持った画像データの伝送、蓄積には、HDTV規格の伝送系や蓄積系を4系統そのまま利用できる。

【0027】また、液晶投写ユニットのリフレッシュ周波数は、伝送規格のフィールド周波数の1/2である。従って、既存の液晶パネルのフリッカ周波数より低くなることはない。従来の技術では、フリッカ周波数を低くしないようにすると、垂直方向の解像度の低下が避けられなかつたが、本実施例によれば、フリッカ周波数を低下させることなく高精細な表示を行うことができる。その結果、既存の液晶表示装置では、実現不可能な大画面、高精細表示システムを安価に提供することができる。

【0028】以上、本発明を実施例に基づき具体的に説明したが、本発明は、前記実施例に限定されるものではなく、その要旨を逸脱しない範囲において種々変更し得ることはいうまでもない。

#### 【0029】

【発明の効果】以上説明したように、本発明によれば、高精細な画像データを既存の伝送規格にて伝送することができる。また、フリッカ周波数を低下させることなく高精細な表示を行うことができる。その結果、既存の液

晶表示装置では実現不可能な大画面、高精細表示システムを安価に提供することができる。

#### 【図面の簡単な説明】

【図1】 本発明の投写型表示装置の駆動装置の一実施例の概略構成を示すブロック図、

【図2】 本実施例の分解された画像データを1/2H期間ずらして伝送することを示す図、

【図3】 本実施例の倍速変換された画像信号を示す図、

【図4】 本実施例において、奇数フィールドと偶数フィールドで表示される画像データを示す図、

【図5】 従来の表示装置の例を示す図、

【図6】 高精細な画像データをどのように分解するかを説明するための図、

【図7】 画素間を重畠することによって元の高精細画像が表示できることを説明するための図、

【図8】 元の高精細画像データと説明のための図との対応を説明するための図、

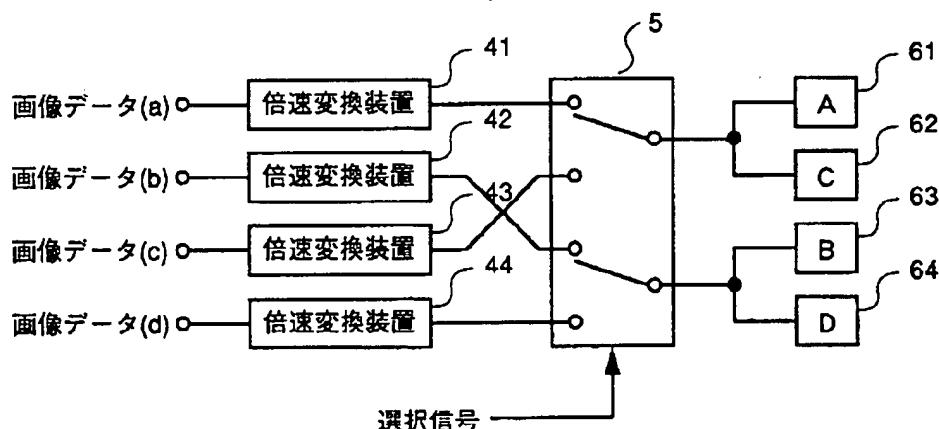
【図9】 従来の表示装置において、奇数フィールドと偶数フィールドで表示される画像データを示す図。

#### 【符号の説明】

1…高精細画像データ、2…画像データ分解装置、3 1～3 4…伝送系、4 1～4 4…倍速変換装置、5…データ分配装置、6 1～6 4…液晶投写ユニット、7…重畠光学系、8…スクリーン、9 1～9 4…ハーフミラー。

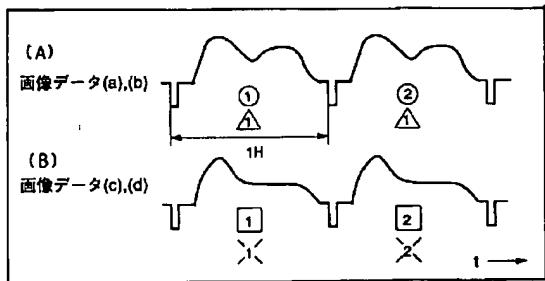
【図1】

図1



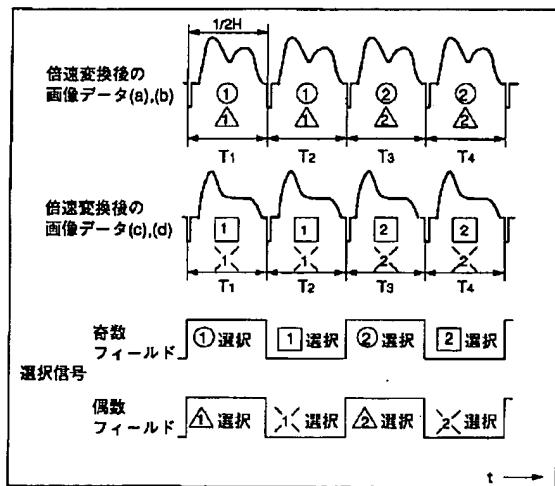
【図2】

図2



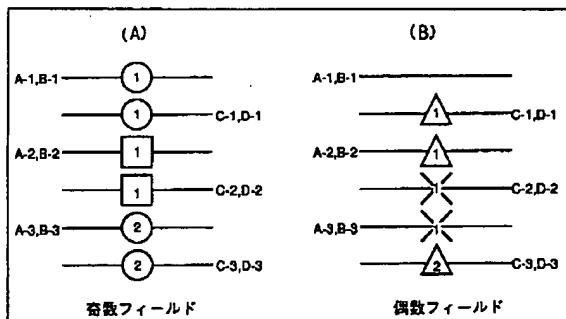
【図3】

図3



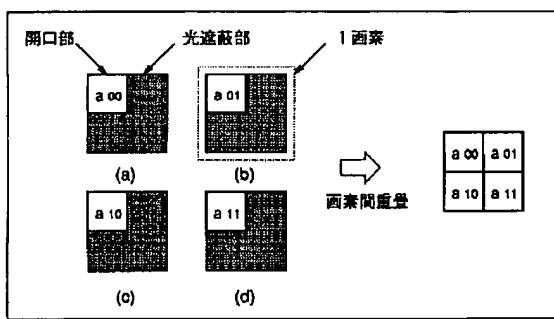
【図4】

図4



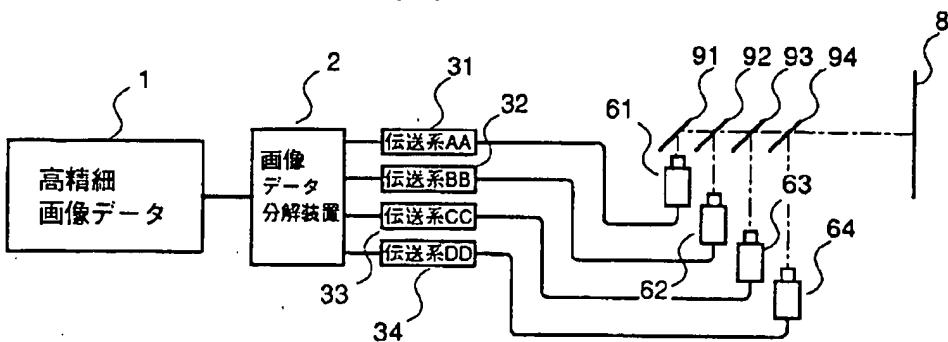
【図7】

図7



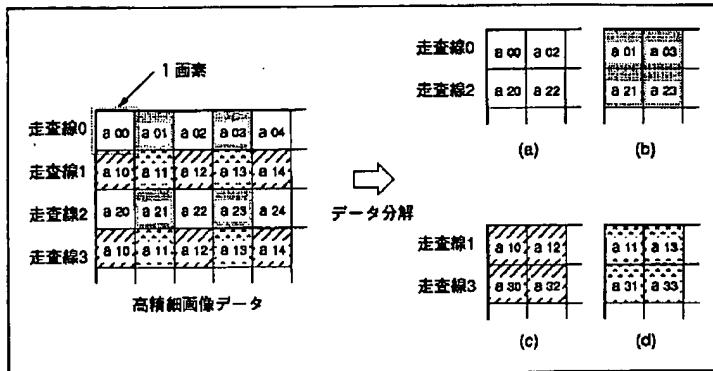
【図5】

図5



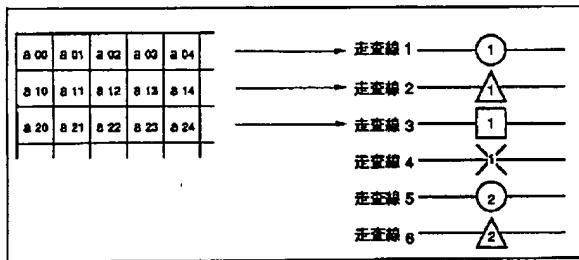
【図6】

図6



【図8】

図8



【図9】

図9

